

WHAT IS CLAIMED IS:

1. A continuous process for the production of dried Superabsorbent polymers (SAPs) by carrying out the polymerization reaction, either in an initially homogenous aqueous monomer solution (bulk aqueous solution polymerization) or in a heterogeneous water-in-oil reactant mixture (reverse phase suspension or emulsion polymerization) within a continuous closed polymerization reactor (1), then drying of the resulting polymer gel within a continuous moved bed in a closed dryer (2), avoiding the needs of standard intermediate maturity tank(s).
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- 15 2. A method according to claim 1, in which the moved bed closed dryer (2) consists of an agitated vessel having at least one agitating shaft, such shaft(s) being heated additionally to the vessel to increase the heat transfer and drying efficiency.
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- 25 3. A method according to claim 2, in which the drying of the polymer is carried out under vacuum or in the presence of heated air, inert gas, steam or a combination thereof, preferably under vacuum.
4. A method according to claim 1 and 2, in which the maturity of the polymer, i.e reaction reaching very high conversion, is carried out into the first zone of the moved bed closed dryer (2).
- 30 5. A method according to claim 1, in which the mixing affect into either or both the closed continuous polymerization reactor (1) and the dryer (2) could be

used to incorporate, to the produced gel, one or more additional (co)monomers, additives (C) and solvents or a combination thereof.

- 5 6. A method according to claim 1, in which the mixing effect into either or both the closed continuous polymerization reactor (1) and the dryer (2) could be used to incorporate, to the produced gel, the recycled dry SAP fines that exit from the continuous discharge system (DS) and the siever.
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- 15 7. A method according to claim 1, in which either or both the continuous polymerization reactor (1) and the dryer (2) could be equipped with condensing and recycling systems of residual reactant(s), solvent(s) and additives or a combination thereof.
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- 25 8. A method according to claim 7, in which the condensing and recycling systems of the continuous polymerization reactor (1) and the dryer (2) could be operated in an independent or combined way.
9. A method according to claim 7, in which the residual reactant(s), solvent(s) and additives or a combination thereof could be totally or partly recycled, together or separately at one or more locations of the continuous production process of claim 1.
- 30 10. A method according to claim 1, in which a pressure lock chamber (7) or a gel cutting system (5) or a combination thereof could be inserted between the continuous polymerization reactor (1) and the dryer (2).

11. A method according to claim 10, in which the type of
the pressure lock chamber is of any type of
commercially available pressure lock chambers,
5 preferably a rotary valve or a piston lock system.

12. A method according to claim 10, in which the pressure
lock chamber could be used to incorporate, to the
reaction mixture exiting the polymerization reactor,
10 one or more additional (co)monomers, additives and/or
solvents or a combination thereof.

13. A method according to claim 10, in which the type of
the gel cutting system is of any type of commercially
15 available cutting systems, preferably the Urshell
cutting system.

14. A method according to claim 10, in which the gel
cutting system could be used to incorporate one or more
20 additional (co)monomers, additives and solvents or a
combination thereof to the reaction mixture exiting the
polymerization reactor.

15. A method according to claim 14, in which the hydrated
25 gel particles of a required size could be continuously
mixed with at least one additive improving free-flowing
and eventually other properties in a mixing screw or in
a rotary mixer-tube (6), which has a final portion with
holes allowing the additive(s) to be recycled before
30 entering the dryer (2).

16. A method according to claim 1 and 10, in which the
continuous polymerization reactor (1), the dryer (2)

and any device between them can function at equal pressure or different pressures.

17. A method according to claim 16, in which the continuous
5 polymerization reactor (1), the dryer (2) and any device between them function under vacuum, preferably at different degrees of vacuum.

18. A method according to claim 17 and 10, in which the
10 degree of vacuum into the dryer (2) is lower, preferably much lower than that in the continuous polymerization reactor (1) and the other devices between them.

15 19. A method according to claim 18 and 10, in which when the hot polymeric mixture enters the dryer (2), which is under much higher temperature and degree of vacuum than the polymerization reactor (1) and intermediate devices, the polymer is readily flashed leading to
20 intensive evaporation of solvent(s) and un-reacted components and hence to higher drying efficiency of the SAP, wherein the flash allows the SAP particles to be more porous and thus to have an increased liquid absorption rate.

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20. A method according to claim 2 and 6, in which the hot and dry SAP particles exiting the dryer (2) can be partly cooled during their passage through the jacketed continuous discharge system (DS) such as cooling lock vessel or other systems.

30 21. A method according to claim 1, 2 and 7, which method, compared to traditional processes for the SAPs

production, has the advantage to yield less residual reactant components and gas wastes to be treated.